UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to:
OSB2000-0008

February 3, 2000

Lawrence C. Evans
U.S. Army Corps of Engineers
Portland District, CENWP-CO-GP
P.O. Box 2946
Portland, OR 97208-2946

Re: Consultation on the Effects of Channel Construction and Associated Aggregate Excavation and Levee Repair (Permit ID #99-806) at Applegate River Gravel Bar on Southern Oregon/Northern California Coho Salmon, Klamath Mountain Province Steelhead, and Southern Oregon/Northern California Coastal Chinook Salmon

Dear Mr. Evans:

This concludes our correspondence regarding the effects on Southern Oregon/Northern California (SONC) coho salmon from issuance of a Section 404 permit to construct a connection channel between aggregate excavation pits and the Applegate River in Josephine County, Oregon. The permit applicant (Copeland Sand and Gravel) proposes to construct the connection channel during the in-water work period of 2000.

The SONC coho salmon was listed by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA) as threatened on May 6, 1997 (62 FR 42588). Critical habitat for SONC coho salmon was designated by the NMFS on May 5, 1999 (64 FR 24049). NMFS concluded that a listing was not warranted for the Klamath Mountain Province (KMP) steelhead (March 19, 1998, 63 FR 13347). The Southern Oregon/Coastal California chinook salmon was proposed for listing under the ESA on March 9, 1998 (63 FR 11482), but new information led the NMFS to conclude on September 16, 1999 (64 FR 50394) that the proposed evolutionarily significant unit (ESU) was in fact composed of two separate ESUs. The NMFS further concluded that the newly delineated ESU relevant to this consultation, the Southern Oregon/Northern California Coast (SONCC) chinook salmon, does not currently warrant listing under the ESA. All three species of anadromous salmonids described above occur in the Applegate River of southwestern Oregon. This consultation is undertaken pursuant to section 7(a)(2) of the ESA and its implementing regulations, 50 CFR Part 402.

In a letter dated June 8, 1999, the Portland District of the U.S. Army Corps of Engineers (COE) requested informal consultation on the effects of Copeland's application (Permit ID #99-806) to construct a channel near Murphy, Josephine County, Oregon on SONC coho salmon, KMP steelhead, and SONCC chinook salmon. The purpose of the proposed project is to allow salmonids to access the off-channel habitat that will be created by Copeland due to the excavation of aggregate material from a gravel bar, and to provide an escape route for salmonids should the excavation site be flooded. Copeland proposes to remove, with heavy machinery, approximately 400,000 cubic yards of sand and gravel from a site at about mile 9 of the Applegate River. The excavation would create several interconnected shallow ponds which are intended to provide rearing habitat for juvenile salmonids. Copeland also proposes to repair an existing levee on the upstream end of the site. Enhancements to the ponds such as plantings of riparian vegetation and placement of large woody debris are also proposed.

In a November 18, 1999 telephone conversation, Dale Haslem (COE Regulatory Branch) agreed that Copeland's plan to excavate aggregate, although not within the COE's permitting jurisdiction, was an interrelated action to the proposed action to be permitted, and that the existence of the excavation pits had more than a negligible likelihood of adversely affecting individuals of the ESA-listed salmon ESU. Consequently, the COE concurred that formal consultation on the effects of the proposed action on SONC coho salmon was warranted.

Enclosed is the Biological Opinion on the COE's issuance of a Section 404 permit to Copeland, and authorizing the incidental take of SONC coho salmon that may be caused by these actions provided that the terms and conditions of the incidental take statement are met. The attached document also serves as a Conference Opinion on the effects of the actions on KMP steelhead and SONCC chinook salmon.

Questions regarding this letter should be directed to Dan Kenney, Fishery Biologist, Oregon State Branch Office at (541) 957-3385.

Sincerely,

fc: William Stelle, Jr.
Regional Administrator

cc: Gordon Dunkeld, Oregon Division of State Lands
David Haight, Oregon Department of Fish and Wildlife
Steve Wille, U.S. Fish and Wildlife Service

Endangered Species Act - Section 7
Consultation

BIOLOGICAL OPINION

Effects of Channel Construction and Associated Aggregate Excavation and Levee Repair (Permit ID #99-806) at Applegate River Gravel Bar on Southern Oregon/Northern California Coho Salmon, Klamath Mountain Province Steelhead, and Southern Oregon/Northern California Coastal Chinook Salmon

Agency: Portland District, U.S. Army Corps of Engineers

Consultation Conducted By: National Marine Fisheries Service, Northwest Region

Date Issued: February 3, 2000

Refer to: OSB2000-0008

TABLE OF CONTENTS

I. BACKGROUND

The Southern Oregon/Northern California (SONC) coho salmon (*Oncorhynchus kisutch*) was listed as threatened under the Endangered Species Act (ESA) by the National Marine Fisheries Service (NMFS) (May 6, 1997, 62 FR 42588). Critical habitat for SONC coho salmon was proposed by the NMFS on November 25, 1997 (62 FR 62741). The NMFS determined that Klamath Mountain Province (KMP) steelhead (*O. mykiss*) did not warrant listing under the ESA (March 19, 1998, 63 FR 13347). The Southern Oregon/California Coastal (SOCC) chinook salmon (*O. tshawytscha*) was proposed for listing under the ESA on March 9, 1998 (63 FR 11482). In a final listing decision on September 16, 1999 (64 FR 50394), the NMFS reclassified much of this Evolutionarily Significant Unit (ESU) into two separate ESUs: a Southern Oregon/Northern California Coastal (SONCC) ESU and a California Coastal ESU. Only the SONCC chinook salmon ESU occurs in the Applegate River and the NMFS found that this ESU did not warrant listing under the ESA. All three species of anadromous salmonids occur in the Applegate River, which is a major tributary of the Rogue River in southwestern Oregon and northern California.

In a letter dated June 8, 1999, the Portland District of the U.S. Army Corps of Engineers (COE) requested informal consultation on the effects of the application (Permit ID #99-806) of Copeland Sand and Gravel (Copeland) to construct a fish access channel to a yet-to-be-excavated gravel pit near Murphy, Josephine County, Oregon on SONC coho salmon, KMP steelhead, and SONCC chinook salmon. Copeland submitted the application under Section 404(b)(1) of the Clean Water Act, which the COE administers. The purpose of the proposed project is to allow salmonids to access the off-channel habitat that will be created by Copeland due to the excavation of aggregate material from a gravel bar, and to provide an escape route for salmonids should the excavation site be flooded. Copeland proposes to remove, with heavy machinery, approximately 400,000 cubic yards (cy) of sand and gravel from a site at about mile 9 of the Applegate River. The excavation would create several interconnected shallow ponds which are intended to provide rearing habitat for juvenile salmonids. Copeland also proposes to repair an existing levee on the upstream end of the site. Enhancements to the ponds, such as plantings of riparian vegetation and placement of large woody debris, are also proposed. The aggregate excavation is proposed to begin in 1999. Attached to the COE's June 8, 1999 letter was a Biological Assessment (BA) prepared by Copeland's consultant (dated November 20, 1998) describing the proposed project.

In a November 18, 1999 telephone conversation, COE and NMFS staff agreed that Copeland's plan to excavate aggregate, although not within the COE's permitting jurisdiction, was an interrelated action to the proposed action to be permitted, and that the existence of the excavation pits had more than a negligible likelihood of adversely affecting individuals of the ESA-listed salmon ESU. Consequently, the COE concurred that formal consultation on the effects of the proposed action on SONC coho salmon was warranted (pers. comm., Dale Haslem, COE).

The objective of this biological opinion is to determine whether the action associated with the 404(b) permit and the interrelated aggregate excavation, levee construction, and other associated activities proposed by Copeland are likely to jeopardize the continued existence of SONC coho salmon, listed as threatened under the ESA, or result in destruction or adverse modification of critical habitat for this species.

II. PROPOSED ACTION

The proposed action is issuance of an individual permit under Section 404(b) of the Clean Water Act by the COE. The permit would allow Copeland to construct a stable connection between the Applegate River and the pits that would remain on the "Wolf" site after the excavation of aggregate. Although aggregate excavation is Copeland's primary interest in the proposed actions, because of its recognition that the existence of aggregate excavation pits on the Wolf site has the potential to affect anadromous salmonids, Copeland has proposed to construct the connection channel and to excavate the pits in a manner that would enhance salmonid habitat in the affected reach of the Applegate River. If carefully developed or reclaimed, abandoned aggregate pits can provide substantial and high-quality off-channel rearing habitat for juvenile salmonids (Norman 1998), especially in riparian corridors where such habitat is scarce. On the other hand, if aggregate excavation pits are not carefully excavated, the pits may be captured at high river flow levels, potentially adversely affecting river geomorphology and salmonid habitat both in the short and long term. Even temporary capture or flooding of gravel pits has the potential to adversely affect individual salmonids if the fish are trapped in the pits when flooding recedes.

The area proposed for aggregate excavation on the Wolf site is above the ordinary high water elevation of the Applegate River and is not a wetland and so would not require 404(b) permitting by the COE. However, the construction of the river-pit connection channel and the excavation and existence of the pits are inherently interrelated actions, and so the effects of these actions will be considered together in this analysis. In addition, as explained below, the repair of the levee at the upstream end of the Wolf site and other activities would also be considered interrelated actions for the purposes of ESA Section 7 consultation, therefore all of the activities Copeland proposes at the Wolf site will be analyzed in this biological opinion (BO).

Copeland believes that the ponds would provide off-channel rearing habitat for juvenile salmonids that is currently in short supply along the mainstem Applegate River. Hyporheic and groundwater flow would enter the ponds through the gravel. The combination of overhead cover from riparian vegetation, low water velocity, and possibly lower water temperature than the main river may provide valuable spring, summer, and fall rearing habitat, especially for SONCC chinook salmon and KMP steelhead. During the winter, Copeland believes that juvenile salmonids, primarily KMP steelhead and SONC coho salmon, would use the ponds to escape high water velocities in the Applegate River.

Even after the levee would be overtopped at high flow levels, Copeland's hydraulic evaluation predicts that water velocities in the ponds would be lower than in other areas of the river channel.

At the Wolf site, Copeland proposes to excavate approximately 400,000 cubic yards (cy) of aggregate to form a series of about eight pits which would be sequentially interconnected through the course of the project. As noted above, the pits would be connected to the Applegate River by a protected channel. The pits would be excavated to an elevation approximately equal to the elevation of the adjacent Applegate River bed (to about 967 feet above mean sea level [MSL], a maximum of about 20 feet in depth) and would total about 36 acres in area. At a water surface elevation of about 670 feet MSL, which would be slightly higher than the mean surface elevation during July and August, water in the pits would be up to roughly 3 feet deep and would cover an area of about 23 acres. The pits—in the context of salmonid rearing habitat, hereafter referred to as ponds—would be contoured with peninsulas and would vary in depth to provide substantial variety in habitat types within the ponds. The ponds would be shaped to retain much of the existing woody vegetation on the site, and additional woody vegetation would be planted along the perimeter of the ponds. In addition, large woody material (LWM) in the form of partial and whole trees would be placed in the pond to further diversify aquatic habitat.

The connection channel between the Applegate River and the pits would be constructed at about river mile 9.0 and would consist of a channel with a mouth at its confluence with the river of about 100 feet in width and a depth approximately equal to that of the river at that point (967 feet MSL), which, as noted above, would also be the elevation of the bottom of the pits. The sides of the channel would be excavated at a 3:1 slope from the native material, and the channel would extend about 300 feet to the nearest aggregate pit. A 2-foot layer of riprap would be placed on the shoreline of the river and channel at their confluence to protect the integrity of the pit-river connection. The riprap would extend from the bed elevation of the river/channel (about 13 feet) to the ordinary high water elevation (at about elevation 972 feet MSL) for about 90 linear feet at each point of confluence.

In addition, Copeland would rebuild a portion of an existing levee (at about Applegate River Mile 9.5) which was breached by high flows in 1997. As noted above, this action is not under the COE's Clean Water Act jurisdiction (because the levee repair would occur entirely above the ordinary high water elevation of the Applegate River), but the reconstruction of the levee would allow Copeland to excavate aggregate from the Wolf site with less of a likelihood that the excavation would be affected by high flows in the Applegate River. The reconstruction of the levee is also a condition placed on Copeland by the landowner. The 350-foot section of the levee that was breached would be rebuilt approximately to the original specifications: About 16 feet in width at the crest and about 75 feet in width at the base, at a 2.5:1 slope on the river side and a 3:1 slope on the upland side. The core of the levee would be constructed of compacted soil and would be covered with geotextile fabric. A 2-foot layer of riprap would be placed atop the fabric to armor both slopes of the levee. No new riprap would be required below the ordinary high water elevation. The crest of the levee would be constructed at 997 feet above mean sea level (MSL), which is about 10 feet above the elevation of the river bed at the site and about 5 feet above the ordinary high water elevation. The reconstructed levee would prevent flows of less than a 10-year recurrence probability from inundating the area which Copeland proposes to excavate for aggregate.

Copeland also proposes to construct a buried sill, approximately 1,200 feet in length just upland from both the existing and proposed rebuilt levee. This sill, to be constructed of compacted soil, geotextile fabric, and riprap, and about 15 feet deep, is designed to protect the Wolf site from hydraulic degradation (in particular, head-cutting) when the levee is topped by high flows in the Applegate River. Because of its location and design, the sill would not require permitting by the COE, but would be an important component of the project in that the buried structure would protect the integrity of both the river channel and the ponds.

Copeland proposes to excavate the aggregate between September 15 and July 1 of five to seven consecutive years. In-water construction of the pit-river connection channel, as well as subsequent breaching of berms between ponds, would occur during the Oregon Department of Fish and Wildlife's (ODFW) in-water work period of July 1 through September 15. The heavy equipment used in the proposed activities would not enter the Applegate River, but would work in-water in the excavation pits, while excavated aggregate would be hauled in trucks without on-site sorting. Fueling of trucks and excavation equipment would be performed away from the site to preclude the possibility of spills. The pits would be excavated in phases and would be separated from previously excavated pits (and the Applegate River) by berms and/or the levee. To prevent turbidity and sediment from entering the river or a pit connected to the river, subsurface water entering the active pit would be pumped to a second (non-surface-connected) pit (or infiltration pond) and the berms between the pits or between a pit and the river would not be breached until excavation has been completed and sediments have settled.

The COE has imposed several conditions on the proposed permit, including ones intended to prevent toxic substances from entering the Applegate River, to minimize damage to riparian vegetation and prevent excess turbidity. In addition, Copeland has proposed to monitor the physical and biological characteristics of the ponds after their construction.

III. BIOLOGICAL INFORMATION AND CRITICAL HABITAT

The listing status, biological information, and critical habitat elements for SONC coho salmon, KMP steelhead, and SONCC chinook salmon are described in the status reviews for the species (Weitkamp *et al.* 1995; Busby *et al.* 1994, and Myers, *et al.* 1998, respectively), in the SONC coho salmon, KMP steelhead, and SONCC chinook salmon final rules (62 FR 24588, 63 FR 13367, and 64 FR 50394, respectively) and in the SONC coho salmon critical habitat designation (64 FR 24049). The recent range-wide status of these species are also summarized in NMFS (1997). Some site-specific information is provided below.

The Applegate River is one of the principal tributaries of the Rogue River and supports runs of SONC coho salmon, KMP steelhead, and SONCC chinook salmon. Flows and water temperatures in the upper part of the Applegate River are influenced by Applegate Dam, a COE flood control project. The effect of dam operations wanes in the lower portion of the river, as tributaries contribute to river flow (C.A. Fustish, Fishery Biologist, ODFW, pers. comm., May 28, 1998). Summer water temperatures in the tributaries and most of the mainstem are higher than desired and are likely a limiting factor for all salmonid species in the Applegate River basin (RVCOG 1997a).

Compared to some other tributaries, the Applegate River is not a major producer of coho salmon in the Rogue River basin (RVCOG 1997a). Some production occurs annually in the system, chiefly in tributaries such as Slate, Cheney, and Williams Creeks and the Little Applegate River. A few coho salmon also spawn in the mainstem of the Applegate River within about 10 miles downstream of Applegate Dam (i.e., well above the project site; C.A. Fustish, ODFW, pers. comm., May 28, 1998). The Applegate River produces substantial numbers of both fall chinook salmon and winter steelhead, and a few summer steelhead. Fall chinook salmon spawn throughout the mainstem of the Applegate River, as do winter steelhead, although this stock also spawns in tributaries. Summer steelhead are thought to be confined to a few tributary streams near the mouth of the Applegate River (C.A. Fustish, ODFW, pers. comm., May 28, 1998).

Most or all juvenile anadromous salmonids spawned in the mainstem of the Applegate River, and many of those produced in tributaries, are pushed downstream to the Rogue River by increasing water temperatures during the summer. This generally occurs by the end of June (C.A. Fustish, ODFW, pers. comm., May 28, 1998) In addition, little off-channel or complex rearing habitat for juvenile salmonids is available in either the mainstem or many of the tributaries during the remainder of the year (RVCOG 1997b). Thus, the availability of juvenile rearing habitat is likely a limiting factor for anadromous salmonids in the Applegate River system, especially for coho salmon and steelhead, which typically smoltify and outmigrate at age 1+ or greater.

Rogue River basin SONC coho salmon smolts typically outmigrate from mid-April through mid-July, with a peak in June (ODFW 1991). Adult coho salmon typically migrate into the Applegate River beginning in October, and spawn mostly in November and December. Adult KMP steelhead in the Rogue River basin enter freshwater from December through April (winter-run) or May through October (summer-run), while the spawn timing of the runs overlaps somewhat, occurring from December through June (RVCOG 1997b). Applegate River winter steelhead peak spawning is thought to occur between mid-April and mid-May, with emergence of fry from May through June, and outmigration of steelhead smolts from mid-March through mid-June (ODFW 1989).

SONCC chinook salmon may be less affected by the availability of rearing habitat in the mainstem of the Applegate River than SONC coho salmon and KMP steelhead because these fish usually outmigrate as subyearlings. Fall chinook salmon emergence in the Applegate River occurs from mid-February through early April, with most fry leaving the Applegate River during May and June and entering the Pacific Ocean mostly in August and September (ODFW 1988). Adult fall chinook salmon typically enter the Rogue River between the middle of August and the middle of September, but the mean date of freshwater entry of fall chinook that later spawned in the lower Applegate River between 1974 and 1978 was September 13 (ODFW 1992). SONCC chinook were observed spawning in the lower Applegate River between 1974 and 1985 from mid-October through early December (ODFW 1992).

Availability of appropriately-sized spawning substrate is not known to be a limiting factor for SONCC chinook in the mainstem of the Rogue below the confluence with the Applegate River (T.D. Satterthwaite, Fishery Biologist, ODFW, pers. comm., May 29, 1998), and the same can also be assumed for KMP steelhead.

In summary, during the period when the river to pond channel connection, and inter-pit berm breaching (and possibly sealing) would occur (July through September 15), it is likely that a few adult summer-run steelhead may be present in the Applegate River or connected ponds, and perhaps a few sub-yearling fall chinook and coho salmon and yearling coho salmon. Many juvenile steelhead of several age classes would also be present in the river and possibly the ponds. Larger numbers of the various anadromous salmonid life-stages would be present in the river or interconnected ponds during the remainder of the year, but none should be present in the active excavation pits, unless a substantial flood overtops the levee. No spawning habitat for SONC coho salmon, KMP steelhead, and SONCC chinook would exist in the ponds (the water velocity would be too low), and so no adult salmonids should enter any of the ponds. The ponds would likely be used by juvenile SONC coho salmon and KMP steelhead year-round and by SONCC chinook salmon in the spring and summer. Essential features of the migratory and rearing habitat for adults and juveniles of all four species are: (1) Substrate, (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food (juvenile only), (8) riparian vegetation, (9) space, and (10) safe passage conditions. The essential features the proposed project may affect are substrate, water quality, water temperature, water velocity, cover/shelter, food, riparian vegetation, and space.

IV. EVALUATING PROPOSED ACTIONS

The standards for determining jeopardy are set forth in Section 7(a)(2) of the ESA as defined by 50 C.F.R. Part 402 (the consultation regulations). NMFS must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify critical habitat. This analysis involves the initial steps of defining the biological requirements and current status of the listed species and evaluating the relevance of the environmental baseline to the species' current status.

Subsequently, NMFS evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NMFS must consider the estimated level of mortality attributable to (1) collective effects of the proposed or continuing action, (2) the environmental baseline, and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed salmonid's life stages that occur beyond the action area. If NMFS finds that the action is likely to jeopardize, NMFS must identify reasonable and prudent alternatives to the action.

Furthermore, NMFS evaluates whether the action, directly or indirectly, is likely to destroy or adversely modify the listed species' proposed or designated critical habitat. NMFS must determine whether habitat modifications appreciably diminish the value of critical habitat for both survival and recovery of the listed species. NMFS identifies those effects of the action that impair the function of any essential element of critical habitat. NMFS then considers whether such impairment appreciably diminishes the habitat's value for the species' survival and recovery. If NMFS concludes that the action will adversely modify critical habitat, it must identify any reasonable and prudent measures available.

For the proposed action, NMFS' jeopardy analysis considers direct or indirect mortality of fish attributable to the action. NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for spawning, rearing, and migration of the listed salmonids under the existing environmental baseline.

A. Biological Requirements and Current Status

The first step in the method NMFS uses for applying the ESA standards of § 7 (a)(2) to listed salmonids is to determine the species' biological requirements that are most relevant to each consultation. NMFS also considers the current status of the listed species taking into account population size, trends, distribution, and genetic diversity. To assess the current status of the listed species, NMFS starts with the documents used to make its determinations to list the particular species for ESA protection, and also considers new data available that is relevant to those determinations (see references in Sections I and III).

The relevant biological requirements are those necessary for the listed species to survive and recover to naturally reproducing population levels at which protection under the ESA would become unnecessary. Adequate population levels must safeguard the genetic diversity of the listed stocks, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

For this consultation, the biological requirements of SONC coho salmon, KMP steelhead, and SONCC chinook salmon are increased spawning, rearing and/or migration survival and improved habitat characteristics that function to support successful spawning, rearing, and migration.

The current status of the affected listed species (SONC coho salmon), based upon its risk of extinction, has not significantly improved since this species was listed. The status of the other two species has also not significantly changed since their "not warranted" determinations were made.

B. Environmental Baseline

The biological requirements of the listed species is not currently being met under the environmental baseline. Its status is such that there must be a significant improvement in the environmental conditions they experience, including the condition of any proposed or designated critical habitat (over those currently available under the environmental baseline). Any further degradation of these conditions would have a significant impact due to the amount of risk the listed salmon presently face under the environmental baseline.

Current range-wide status of affected species under environmental baseline. NMFS described the current population status of the SONC coho salmon, KMP steelhead, and SONCC chinook salmon in their status reviews (Weitkamp *et al.* 1995; Busby *et al.* 1994, and Myers, *et al.* 1998, respectively), and in the SONC coho salmon, KMP steelhead, and SONCC chinook salmon final rules (62 FR 24588, 63 FR 13367, and 64 FR 50394, respectively) and the SONCC chinook salmon proposed rule (63 FR 11482). Critical habitat for SONC coho salmon was designated by the NMFS on May 5, 1999 (64 FR 24049). The recent range-wide status of these species are also summarized in NMFS (1997).

Current status of affected species under environmental baseline within the action area. The action area is defined as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action" (50 CFR 402.02). The general action area can be defined as the Applegate River watershed, in particular the river reach just above, at, and just downstream of the Wolf site; this area is within proposed critical habitat for SONC coho salmon.

V. ANALYSIS OF EFFECTS

A. Effects of Proposed Action

The principal latent effects of the construction of the proposed levee repairs, rock sill, river-pit connection channel, and the interrelated aggregate excavation to SONC coho salmon, KMP steelhead, and SONCC chinook salmon and SONC coho salmon critical habitat are related to the existence of river connected pits and their influence on salmonid rearing habitat. In addition, the construction/excavation activities have some potential for short-term direct adverse effects to individuals of the three anadromous fish species through direct contact with construction/excavation equipment, the possible introduction of sediment and toxic contaminants into the ponds or Applegate River, and possible loss of access to the river.

Also, the levee repair, sill construction, and removal of aggregate from the Wolf site are likely to evoke a geomorphological response from the Applegate River which may affect the species of interest, as may actions affecting riparian vegetation.

I. Quality of pits/ponds as salmonid rearing habitat. After the aggregate excavation is completed at each pit on the site and the berm separating the pit/pond from the pond (or river connection channel) just downstream is removed, SONC coho salmon, KMP steelhead, and SONCC chinook salmon will have free access to that pond, as will other Applegate River aquatic organisms. Adult salmon or steelhead are unlikely to be affected by the existence of the ponds, because neither the ponds nor connection channel would provide spawning habitat and these fish do not feed. Juvenile salmonids, however, would inhabit the Applegate River year-around and are likely to use the ponds.

Because the bottom of the river-pond access channel and the ponds are designed to be at the same elevation as the Applegate River bottom, with proper construction techniques, the Wolf site ponds should become and remain physically accessible to juvenile salmonids. It is possible that extremely high flow events in the river (those exceeding the 50 to 100 year recurrence flood) may alter the river, pond, and/or access channel morphology, but Copeland will be required to provide equipment and personnel to re-establish access to the Wolf site following such events for at least 5 years after the project is completed if the NMFS and ODFW agree that such an action is prudent. Based on a previous Copeland project on the Applegate River (Reeve *et al*. 1999), it is reasonable to expect that at least a few juvenile salmonids will find and occupy off-channel habitat such as the proposed Wolf site ponds, if it is available and accessible.

The chief potential benefit of the ponds for anadromous salmonids would be enhanced rearing habitat. Specifically, SONC coho salmon could rear in the ponds as fry and parr for up to about a year between their emergence and outmigration as smolts. Because coho salmon are not known to spawn in the mainstem Applegate River in the vicinity of the Wolf site, juvenile coho salmon would first have to emigrate from natal areas in order to discover and use the ponds. However, pre-smolt emigration from sub-optimal or overcrowded habitat is common and deep, low-velocity pool and side channel/pond habitat is preferred by juvenile coho salmon, especially during winter high flows (Sandercock 1991). Therefore, it is likely that the proposed ponds at the Wolf site would be discovered and used by juvenile SONC coho salmon.

The life cycle and behavior of KMP steelhead in the Applegate River system is similar to that of SONC coho salmon, with the exceptions that steelhead are likely to spawn in the Applegate River mainstem in the vicinity of the Wolf site and that juvenile steelhead have a somewhat lesser preference than coho salmon for the type of habitat that the ponds would provide. It is expected, however, that juvenile steelhead would enter and use the ponds as rearing habitat, especially during winter high flows.

The characteristics and habits of juvenile SONCC chinook salmon in the Applegate River are substantially different than those of SONC coho salmon and KMP steelhead. Although chinook salmon are likely to spawn in the mainstem Applegate River in the vicinity of the Wolf site, nearly all juveniles would outmigrate to the Rogue River and the Pacific Ocean within a few months of emergence. Ocean-type chinook salmon fry and parr are known to utilize the type of habitat that the ponds would provide, although less so than coho salmon (Healey 1991), but their use of the Wolf site ponds would be limited to a few months in spring and early summer.

While some of the habitat characteristics of the ponds will be nearly identical to those of the river, other habitat features will be moderately to substantially different, leading to both possible beneficial and adverse effects to individual salmonids which may use the ponds. Because the magnitude of the differences in habitat conditions between the ponds and the Applegate River and the physiological needs of the rearing juvenile salmonids are likely to vary from year to year and season to season, it is also likely that salmonids may move between the ponds and the river in response to this temporal variation. The components of the juvenile salmonid rearing habitat in the ponds that may vary the most from Applegate River rearing habitat include the presence of large volumes of low velocity water, predation and competition, and water temperature.

Water Velocity. Because water would typically enter the ponds through diffuse hyporheic and groundwater flow, and because the typical volume of inflow would only be about 2 cfs, water velocity through the ponds would normally be close to zero. Only at flows in excess of the 10-year recurrence interval flood would the levee be topped by the Applegate River and surface water flow into the ponds. Assuming that the levee and/or sill is not breached and the main channel of the river is not diverted through the Wolf site, the ponds should provide relatively low-velocity shelter for juvenile salmonids even during low-recurrence flood events. This is because relatively little water, compared to the mainstem of the river, would flow through the ponds and because the physical structure of the ponds and the existence of substantial riparian vegetation and LWM would provide. Fish in streams which have relatively small amounts of low-velocity shelter habitat are likely to be at a greater risk of injury, mortality, or displacement to unfavorable habitat during high flow events than fish in streams in which such habitat is relatively abundant. Off-channel and other types of low-velocity shelter are thought to be in relatively short supply in the Applegate River; it is likely, therefore, that juvenile salmonids in the project area would potentially benefit from the existence of the Wolf site ponds during high flow events.

Even during periods of more moderate flow levels in the Applegate River, use of low-velocity habitat in the ponds at the Wolf site may be beneficial to salmonids. Other factors being equal, juvenile salmonids living in streams are likely to grow more slowly than juvenile salmonids living in ponds because more energy would be expended by the stream-dwelling fish in swimming against the current. Juvenile salmonids which would use the Wolf site ponds may therefore grow more quickly and attain larger size prior to smolt outmigration than those in the mainstem Applegate River (assuming that adequate food resources are available), which may lead to higher smolt and adult survival, and subsequent higher numbers of adult spawners in the Applegate River watershed.

On the other hand, the amount, availability, and value of macroinvertebrates and other juvenile salmonid prey items may be proportionally less in low-velocity habitat like the ponds than in the Applegate River, so it is unclear whether individual salmonid growth would increase because of the ponds. However, when completed, the ponds would represent more than 20 surface acres of additional habitat for Applegate River salmonids (equal in area to more than 7,000 feet of river), so even if the pond habitat is less productive than the river habitat, a substantial net gain in juvenile salmonid productivity for the Applegate River should occur.

Predation and competition. Juvenile salmonids are prominently preyed upon by other fish and by birds. Exotic predaceous fish such as largemouth and smallmouth bass, bluegill, sunfish, and Umpqua pikeminnow (each is known to occur in the Applegate River) as well as larger native salmonids are likely to find suitable living conditions in the Wolf area ponds. Similarly, piscivorous birds such as herons and kingfishers are also likely to fish in the ponds. Each of the exotic fish species mentioned above, as well as adults and/or juveniles of several native fish species such as the redside shiner, have the potential to compete with juvenile salmonids for food, in both the Applegate River and the proposed ponds.

Monitoring of constructed alcoves at the “B” site on the Applegate River during the summer of 1999 (Reeve *et al.* 1999) revealed that Umpqua pikeminnow and bluegill used some of the alcoves, as did juvenile steelhead (or rainbow trout) and chinook salmon, but no acts of predation by fish were observed (Todd Reeve, Fishery Biologist, Applegate River Watershed Council, pers. comm., Nov. 24, 1999). Many redside shiners were also observed in the alcoves. Umpqua pikeminnow, redside shiner, and to a lesser extent, smallmouth bass are likely well adapted to existence in the mainstem of the Applegate River, but largemouth bass and bluegill would likely find the Wolf area ponds to provide substantially superior habitat than the mainstem river. This is because these species thrive in slow-moving water with abundant macrophytes. A bluegill, in fact, was observed guarding a nest in a “B” site alcove, so it is quite likely that access to the ponds would lead to a localized increase in population by this species. The population size of largemouth bass and bluegill would also likely increase in the project area because of the substantially increased quality and quantity of spawning and rearing habitat provided by the ponds for these species. Umpqua pikeminnows, redside shiners, and smallmouth bass, on the other hand, may also benefit from the increase in river-connected aquatic area, but it is less certain that the habitat provided by the ponds would be of substantially higher quality than now exists in the Applegate River. As for avian predators, while both herons and kingfishers would undoubtedly be drawn to the ponds, individuals of both species are capable of successfully foraging in the Applegate River, so it seems unlikely that the existence of the ponds would greatly affect the population density of either species in the project area.

While it is certain that bass, shiners, herons, etc., may inhabit, use, or even thrive in the proposed Wolf area ponds, and that these various animals may prey on or compete with individual juvenile anadromous salmonids, it is difficult to say whether the overall effect of the predators and competitors on the salmonid species of interest would be higher in the ponds or in the mainstem Applegate or Rogue rivers.

While a smallmouth bass, for example, may eat any small juvenile coho salmon that becomes available to it in one of the ponds, the use of large woody debris (which is not abundant in the river) by the salmon may make redside shiners or juvenile bluegill much more common prey items for bass. Similarly, the ponds' riparian plantings may eventually provide a higher level of protection from kingfishers to surface-feeding juvenile chinook salmon than exists in the river. Thus, the long-term effects of pond-related predation and competition on the Applegate River SONC coho salmon, KMP steelhead, and SONCC chinook salmon populations are largely speculative.

Water temperature. Because of prolonged contact with subsurface alluvium or other geologic formations, groundwater (and to a lesser extent, hyporheic flow) that would flow into the Wolf site ponds is likely to vary little in temperature over the seasons. Therefore, the pond inflow is likely to be considerably cooler than the surface water in the Applegate River during the summer and early fall, and substantially warmer than the surface water in the Applegate River during the winter and early spring. However, because the volume of water in the ponds would be relatively large compared to the volume of inflow—for example, assuming 20 acres of ponds with an average depth of 3 feet and an average inflow of a little more than 2 cfs, full turnover time would be about 15 days—factors such as solar radiation, radiative gain or loss to the atmosphere, and shading are likely to have a large influence on the temperature regime of the ponds.

Copeland's consultant, Pacific Habitat Services, Inc. (PHS), conducted an analysis of the relevant hydrological, meteorological, and geomorphological conditions at the Wolf site and came to the conclusion that mean daily water temperatures in the ponds would range from about 40° F (4.4° C) in the winter to about 64° F (17.8° C) in the summer. The peak temperature that is likely to be attained in the ponds, however, is likely higher than that calculated by PHS, because the minimum depth of the pond was assumed to be 3 feet. This "minimum" depth was calculated from an Applegate River flow volume of 220 cfs (Peter Keefe, Engineer, David J. Newton Associates (DJNA), pers. comm., Dec. 14, 1999). However, this discharge equals or is slightly more than the <u>mean</u> flow volume in the lower Applegate River during July and August (Hubbard *et al.* 1999), meaning that the ponds are likely to be shallower than modeled at least half of the two warmest months of the year. Because water depth is one of the principal variables in the PHS temperature model and because summer water temperature in the ponds is likely to vary inversely with water depth (Dale Groff, PHS, pers. comm., Dec. 7, 1999), it seems likely that the mean water temperature in the ponds could substantially exceed 64° F during many days in July and August. On the other hand, however, after riparian vegetation around the ponds matures, summer water temperatures in the ponds would potentially be somewhat cooler than modeled by PHS because of substantial shade.

The upper lethal temperature for coho and chinook salmon and steelhead has been measured in the laboratory at about 71.6° to 84.2° F, but their preferred temperature range for these species is about 50° to 57° F (Bjornn and Reiser 1991). Water temperature measured at the U.S. Geological Survey's Wilderville gage (about 1.5 miles downstream from the Wolf site) was highest during July and August of 1996 through 1999 (COE 1999). In 1996, hourly water temperature at the Wilderville gage peaked at about 81° F on several days in July. In 1997, peak temperatures at the gage were roughly 75° F on a few days in August. Similarly, peak hourly river temperature in 1998 was approximately 77° F and in 1999 was about 73° F. Throughout July and August of these years however, the hourly temperature varied through the day, with the highest daily water temperatures generally recorded at 1700 or 1800 hours and lowest temperatures at 0800 or 0900 hours. Typically during these months the daily range in water temperature was around 39° to 43° F, so it seems unlikely that juvenile salmon would become thermally trapped in the ponds. For example, even at apparently lethal maximum daily river temperatures (e.g., 80.6° F on July 25, 1996 at 1800), water temperatures drop out of the lethal range within a few hours (to 72.1° F by 0800 the next day)(COE 1999).

At Site "B," water temperature in the mainstem of the Applegate River varied from 61.3° to 73.2° F from July 9 through August 18, 1999 (Reeve *et al.* 1999). During the same period, daily mean water temperatures recorded at a few of the sites in the alcoves were slightly lower than at the mainstem location, but were higher than at the mainstem site at most of the alcove sites. Nearly all of the alcove sites with the lowest mean temperatures, however, did not have minimum temperatures as low as those recorded at the mainstem site, and showed much less diel variation in temperature. In addition, some of the alcove sites had both high mean water temperatures, high maximum water temperatures (up to 83.7° F), and substantial diel variation in water temperature. The sites with the lowest mean water temperatures and the least variation in temperature were apparently highly influenced by hyporheic flow (Reeve *et al.* 1999).

Assuming that the water temperature characteristics of the Applegate River at the proposed project site are similar to those at the Wilderville gage, near-lethal peak temperatures for salmonids are likely to occur in the Applegate River at the site during many or most days in July and August. This assumption is consistent with ODFW's conclusion that few juvenile salmonids summer in the lower Applegate River. Mabbott (1982, in Bjornn and Reiser 1991) found that young salmon and trout moved out of rivers in Idaho, where summer maximum temperatures were 75° to 79° F, to cooler areas even when summer minimum temperatures were 59° to 61° F. On the other hand, Bjornn (1978, in Bjornn and Reiser 1991) found that juvenile chinook salmon and steelhead maintained high densities and grew normally in a stream with brief maximum daily temperatures up to 75° F, but where daily minimum temperatures were in the 46° to 54° F range. At Site "B," the presence of salmonids in the alcoves seemed to be associated with relatively low water temperatures and high levels of hyporheic flow (Reeve *et al.* 1999). It would seem that juvenile salmon in a river with high daily maximum temperatures are likely to migrate to cooler areas, unless the daily minimum (and presumably mean) water temperatures are considerably lower than the maximum.

Based on the above literature review and the difference between PHS' calculated maximum pond temperature and measured river temperatures, it appears that juvenile salmonids would potentially benefit from access to the thermal refuge that the ponds may provide during the summer. Whether the potential benefit is realized for a substantial number of juvenile salmonids is dependent upon a number of factors. These major factors include the validity of PHS' calculations and the distribution of the areas relatively cool water in the ponds and the river. The NMFS does not have the expertise to verify or dispute PHS' calculations, but notes that the model results obtained by PHS are single value daily means. Realistically, the water temperature in the ponds would vary hourly through each day (although probably not nearly as much as the river) and there would be some, perhaps substantial, variation in water temperature in the ponds depending on location and depth. Such temporal and spatial variability in water temperature in the ponds is likely to translate into differential thermal attractiveness for the fish at issue, that is, juvenile salmonids would likely prefer some areas of the ponds over others during periods of thermal stress; it is not at all clear that all areas of the ponds would be thermally habitable during periods of peak solar radiation.

Obviously, in order to benefit from areas of cool water in the ponds, these areas would have to be both detectable and accessible to juvenile salmonids. Salmon and steelhead parr already residing in the ponds should be able to locate and move to specific thermal refuge sites relatively easily, because the low velocity of water in the ponds should allow any temporal and spatial gradients in water temperature to develop gradually. In the mainstem of the Applegate River, however, salmonid parr may be forced to quickly seek thermal shelter in small pockets of cool groundwater input surrounded by a matrix of relatively high ambient river water temperature—alternately, many of the fish may outmigrate to the Rogue River. This situation may sometimes restrict the ability of fish to detect and/or access the river-pond connecting channel, but the substantial diel variation in Applegate River water temperature in the summer should allow juvenile fish to move out of thermal refugia in the river for at least a portion of each day. However, even if fish in the river are able to find the mouth of the river-pond channel, these fish would likely not be able to detect the coolest (and possibly most beneficial) pond areas. This is because the water in the channel connecting the ponds to the river is downstream from the ponds and so its temperature is likely to be greater than the mean temperature of the ponds. The temperature of the water in the channel may even be higher than the river temperature for a few hours each day during a portion of the summer, as the thermal inertia of the ponds would be greater than that of the river. So, assuming PHS' calculations are correct, juvenile salmonids over-summering in the ponds should enjoy favorable thermal conditions, but it is unclear whether the ponds would attract salmonids from the Applegate River during this period.

Rearing habitat synthesis. The construction of approximately 20 acres of river-connected ponds at the Wolf site would increase the amount of aquatic habitat associated with the Applegate River. This aquatic habitat could be used by juvenile salmonids as rearing habitat, but would have somewhat different characteristics than mainstem river rearing habitat. As discussed above, some aspects of the pond rearing habitat are likely to be superior to that of the river rearing habitat and some aspects are likely to be inferior, but the relative quality of the pond habitat compared to the river habitat is mostly speculative at this point. Not only is the likely quality of any particular aspect of pond rearing habitat uncertain, but the interaction of the habitat characteristics—such as the effect of water temperature on predaceous fish growth and recruitment—is also highly speculative. In addition, likely changes in the pond habitat over time and the effect of stochastic physical processes such as floods, are difficult to predict.

As a result, it will be necessary to establish a monitoring program for the ponds to ensure that they provide a net benefit to SONC coho salmon and other salmonids in the Applegate River over time. Copeland has suggested several potential areas of investigation, and the NMFS has specified necessary monitoring activities as nondiscretionary Terms and Conditions of the attached Incidental Take Statement.

II. Short term construction-related effects. Certain aspects of the river-pond connection channel, breaching and riprap armoring, inter-pond berm breaching, levee and sill construction, and aggregate excavation have the potential to adversely affect individual SONC coho salmon, KMP steelhead, and SONCC chinook salmon through direct contact with construction/excavation equipment, the introduction of sediment or toxic substances into the ponds and Applegate River, and loss of access to the river.

Contact with heavy equipment. It is possible that individual salmonids may, in the process of pond/channel/river berm breaching, riprap armoring, or aggregate excavation, come in contact with the heavy equipment (e.g. an excavator bucket) or with aggregate or riprap manipulated by the heavy equipment. Because it involves excavation and rock placement in the Applegate River, it is likely that the channel river berm breaching and armoring has the greatest potential for causing direct injury or mortality to salmonids. It seems likely that the breaching of the berms between ponds and the excavation of the pits/ponds would have less of a likelihood of harming salmonids because much of the excavation would be performed before fish have access to the areas. If construction/excavation work in the river or in a pit/pond/channel connected to the river occurs during the ODFW in-water work window of July 1 through September 15, it is likely that no adults, eggs, or pre-emergent fry of any of the three anadromous salmonid species at issue would be affected by in-water work.

To armor the mouth of the pond/river connection channel, Copeland proposes to place a 2-foot layer of riprap which would be keyed into the bank and river bottom (i.e., excavation within the wetted channel of the river is proposed). The keying excavation and riprap placement would be performed from the top of the river bank with the bucket of an excavator or similar equipment.

As described above, aggregate would be excavated from pits without a surface connection to the river, so no fish should occur within the pits. The most likely potential for direct contact with fish during aggregate excavation would occur when a berm between two pits, or between the connection channel and the Applegate River, is breached. The volume of the excavation associated with each berm would vary, but would be much less than the volume of the pits/connection channel. Only the bucket and arm of the heavy equipment would enter the water during berm-breaching operations.

The other potential interaction between excavation equipment and fish would occur if an active Wolf site pit were to be inundated by flooding from the Applegate River and that pit was later re-activated. As described above, Copeland proposes to cease excavation of any pit that is inundated by high water, to breach any such pit to allow fish access from the pit to the river, and, if substantial aggregate remains to be mined from the pit, to rebuild the berm. If this situation were to transpire, there would be the potential for fish that had entered the pit during flooding or after breaching to be affected by the excavation equipment.

In the scenarios described above, fish in the path of excavator buckets or other equipment could be crushed by the movement of the equipment, aggregate, or riprap, or captured within the bucket and dumped in a truck with the aggregate. Either of these scenarios would likely cause injury or death to the affected fish. Noise, light, vibration, etc. from Copeland's operation may also disturb migrating or rearing SONC coho salmon, KMP steelhead, and SONCC chinook, causing individuals to avoid the immediate construction/excavation area. Finally, similar direct effects to other lower Applegate River organisms, such as benthic invertebrates and several species of fish, may occur due to contact with an excavator bucket or manipulated riprap or aggregate.

While the possibility exists that direct physical harm could occur to SONC coho salmon or SONCC chinook salmon due to the use of Copeland's equipment, it seems likely that such injuries would be rare. This is because relatively few salmon are likely to occur in the lower Applegate River during the proposed in-water work period, and the majority of these fish are both wary of potential danger and have substantial swimming ability. Lower Applegate River sub-yearling coho and chinook salmon would be a minimum of about 70 mm and 100 mm in length, respectively, by July (C.A. Fustish, ODFW, pers. comm., May 29, 1998). That is, the noise, movement, etc. from Copeland's equipment are likely to be easily detectable by salmon from a sufficient distance to allow the fish to avoid the area of danger. During the in-water work window, subyearling KMP steelhead, however, are likely to be smaller and therefore less mobile than subyearling coho or chinook salmon, as well as relatively abundant in the lower Applegate River (ODFW 1988). It is possible, therefore, that the manipulation of riprap and aggregate during the in-water work period would affect more steelhead than salmon, but the area of impact, and hence the number of fish affected, would still be small. While the noise, etc., generated by Copeland's operation has the potential to disturb fish in the river, the zone of significant disturbance would be small compared to the remainder of the lower Applegate River, and so should not adversely affect individuals of the species.

Less mobile forms of salmon and steelhead, such as eggs and pre-emergent fry, should not occur in the lower Applegate River during the in-water work period, and would not be affected by the proposed action. Injury and mortality to benthic invertebrates, as well as eggs and larvae of other fish species, may occur because of the proposed activities, but the area of impact in the river is small and recovery of local populations rapid, so it is likely that the indirect effects on SONC coho salmon, KMP steelhead, and SONCC chinook would be minimal.

Sediment and Toxic Contaminants. In-water excavation and riprap armoring has the potential to introduce and mobilize fine sediment into the Applegate River or the proposed Wolf area ponds while operation of heavy equipment, trucks, pumps, etc., requires the use of fuel and lubricants which could injure or kill aquatic organisms if introduced into the water.

Regarding sedimentation, the proposed in-water activities have the potential to indirectly affect SONC coho salmon, KMP steelhead, and SONCC chinook salmon through impacts to habitat (including primary and secondary productivity), while some direct effects of these activities to individual salmon are also possible. Principally, these activities would create turbidity (suspended sediments) in the ponds and, to a much lesser extent, the Applegate River from fine sediments in the materials that would be placed or excavated. Sediment and turbidity generated during aggregate excavation in the pits should typically not affect salmonids because water would be pumped from the active excavation pit to another pit or settling pond not connected to the river. Sediment would be transmitted to fish-accessible areas only during breaching of pond berms and during connection channel construction. In addition, if a pit is flooded by high flows from the Applegate River, and then the berm is breached and eventually rebuilt, any fish trapped in the re-activated pit would be subjected to high turbidity and sedimentation generated by aggregate excavation. Most of the suspended sediment generated or mobilized by the proposed activities would deposit in the pits/ponds, the connection channel, or the Applegate River a short distance downstream of the levee and connection channel sites.

Turbidity, at moderate levels, has the potential to adversely affect primary and secondary productivity, and at high levels, has the potential to injure and kill adult and juvenile fish, and may also interfere with feeding (Spence *et al*. 1996). Newly emerged salmonid fry may be vulnerable to even moderate amounts of turbidity (Bjornn and Reiser 1991). Fine redeposited sediments also have the potential to adversely affect primary and secondary productivity (Spence *et al*. 1996), and to reduce incubation success (Bell 1991) and cover for juvenile salmonids (Bjornn and Reiser 1991).

Primary and secondary production would not likely be substantially affected by the proposed action because of the relatively small amount and short duration of turbidity produced by the connection channel construction and berm breaching. Similarly, effects of the deposited fine sediment should be minor. As noted above, turbidity generated by excavation of aggregate pits should generally not reach areas where fish are present, because turbidity created in the pits would be allowed to dissipate before the connection between the pond and the river is made.
Thus, the effects of turbidity released to the river would be minor and short-term, as would the effects of deposited sediment.

Although turbidity has some potential to directly adversely affect fish, this usually occurs in situations where no relief from the turbidity is possible. In the Applegate River, any juvenile SONC coho salmon, KMP steelhead, and SONCC chinook salmon present during the proposed activities would have the opportunity to move out of the minor and short-term turbidity plumes created by the proposed action, so no direct adverse effect is likely. Also, indirect effects of turbidity on juvenile salmon and steelhead, such as a reduction in prey availability, seem unlikely due to the small scale of the action's effect on benthic invertebrates. Deposited sediments should have a similar negligible effect on SONC coho salmon, because no spawning of this species is likely to occur in the lower Applegate River.

Although KMP steelhead and SONCC chinook salmon spawn in the lower Applegate River, the likely small scale and short duration of sediment deposition associated with the proposed actions would mean that effects on spawning and incubation habitat should be negligible.

Regarding the potential for fuel and lubricants associated with the proposed actions to adversely affect anadromous salmonids, Copeland plans to perform all refueling of trucks at an off-site location. Also, the COE requires, as a condition of the proposed permit, that Copeland take care to prevent any petroleum products, chemicals, or other deleterious materials from entering the water. Assuming that Copeland meets these conditions, it is unlikely that a substantial spill will occur. Even if a spill of a toxic material were to occur during levee repair and connection channel armoring, it is likely that the volume of flow in the river would quickly dilute the substance to a non-lethal level for any anadromous salmonids that might be in the vicinity. A spill of toxic material in an active aggregate excavation pit should not affect anadromous fish, for reasons described above, while a spill during berm breaching is unlikely because such activities would be relatively brief.

Stranding/trapping. Rapid fluctuation of river elevation sometimes strands aquatic creatures on dewatered flats or in diminishing pools. Also, the gradual decrease in depth of a water body can leave its inhabitants with nowhere to go. The specifications of the proposed ponds and connecting channel should prevent juvenile SONC coho salmon, KMP steelhead, and SONCC chinook salmon from suffering this fate. Specifically, Copeland has proposed to excavate the ponds and channel to no greater depth than the elevation of the river bottom at its junction with the proposed connection channel. In addition, the sides of the ponds and channel will be excavated on a continuous, albeit variable, slope, so there should be no opportunity for shoreline stranding. In addition, Copeland will be required to excavate the ponds so that the bottom elevation remains level or decreases from the upper end of the upper-most pond to connection channel at the river. Copeland will also be required to maintain the connection channel at its construction depth. These measures should prevent juvenile salmonids from being stranded in the ponds, should the water elevation drop at low river discharge.

The trapping scenario would begin with the introduction of fish into an active pit during a high flow event. As noted above, Copeland proposes to breach the berm enclosing any such inundated pit as soon as possible after high water recedes, so that trapped fish would be able to escape the pit. If substantial aggregate still exists in the pit at issue, however, Copeland proposes to repair the berm during the in-water work period and resume excavation after September 15. There is some potential for trapping of fish within the re-isolated pit; even if the trapped fish in this scenario are not injured during further aggregate excavation, they would not be able to escape the pit until the following in-water work window (or flood-related inundation of the pit), and so may be unable to outmigrate as smolts with their year-class. Altered outmigration timing would not be inevitably fatal to such fish, but would probably decrease their likelihood of survival. The above scenario, while possible, is unlikely to affect substantial numbers of fish, because the flow event would be rare.

III. Alteration of riverine habitat. In addition to the obvious loss of potential in-stream substrate, extraction of aggregate from the floodplain of the lower Applegate River has the potential to change the hydraulic attributes of the river at high flow and the future configuration of the river channel. Because the type and amount of substrate in the wetted channel, as well as the hydraulic attributes of the channel are components of the physical environment in which SONC coho salmon, KMP steelhead, and SONCC chinook salmon exist, it is possible that the loss of aggregate in the lower Applegate and Rogue rivers may affect these species. In addition, activities in proximity to the Applegate River may affect riparian vegetation.

The most common fisheries concern related to aggregate mining from stream channels is loss of spawning habitat. In addition, as noted above, interstices between large substrate particles can provide cover for juvenile salmonids. In many streams, large substrate (chiefly boulders and cobble) provides stream bottom roughness, forming areas of hydraulic shelter for adult and juvenile salmonids. Substrate of all sizes provides habitat for benthic organisms, which are a major part of the Rogue River basin food web.

Aerial photographs of the subject river reach beginning in 1967 show that the Applegate River flowed in its current configuration until a flood in January 1974, when a new channel was cut through the existing Wolf property. The COE completed construction of a levee in 1976 which returned the river to its previous channel. On December 31, 1996 and January 1, 1997 a flood estimated at 43,800 cfs (at the Wilderville gage) topped and partially breached the COE levee, inundating the Wolf site, although enough of the levee remained to prevent the river from establishing a new channel through the site. Copeland’s engineering consultant determined the New Year’s flood was a 50 to 100 year event (Peter Keefe, Engineer, DJNA, pers. comm., Dec. 3, 1999). As discussed above, Copeland proposes to rebuild the breached levee section to a height which would prevent runoff events of more than a 10-year recurrence interval from topping the levee, and to construct a buried rock sill that would inhibit overtopping events from eroding a new river channel through the Wolf site.

Assuming Copeland’s hydrologic and engineering calculations are correct and that the levee, sill, ponds etc., are properly constructed, the proposed actions would likely confine the subject reach of the Applegate River to its current channel through all but the rarest high flow events. Therefore, the removal of up to about 400,000 cy of aggregate from the Wolf site following the proposed channel confining activities should not affect the quantity or quality of stream substrate in the Applegate River, because there is only a small likelihood that substantial amounts of alluvium at the Wolf site would be mobilized into the Applegate River channel. In addition, the lower Applegate River is an alluvium-rich area and substantial potential stream substrate will remain on the site. Therefore, it is unlikely that the excavation and removal of the aggregate would adversely affect the quantity or quality of stream substrate for the purposes of spawning, shelter, etc.

While the removal of alluvium from the Wolf site under the specified conditions is unlikely to affect in-stream habitat values, the confinement of a river reach to a particular channel has some potential to alter salmonid habitat in that channel. Usually, however, the construction of a levee is intended to reduce stream sinuosity and meander-forming process and to confine relatively low-recurrence floods to straightened stream channel. In the absence of a levee at the Wolf site, however, the Applegate River is likely to reduce stream sinuosity by cutting off the existing meander, as it did in 1974 and nearly did in 1997; in addition, the proposed action would allow events of greater than a 10-year recurrence interval to expand onto the Wolf site. In this situation, then, the proposed levee and sill would protect the existing meander but would still allow flow events of moderate frequency to interact with the site.

The chief consequence of protecting the meander would be a reduction in mean water velocity in the reach, compared to the mean water velocity in a meander cut-off. Less water velocity in the existing channel has the potential to reduce bed load transport rates, which could cause the meander reach to aggrade. Only about 10% of one side of the subject reach would be constrained by the reconstructed levee, however, so because the river would have the ability to move laterally, it seems unlikely that any aggradation of the meander reach would lead to substantial braiding or other undesired conditions. Additionally, Copeland's consultant's hydraulic analysis of the proposed actions shows only minimal changes in flood water elevation resulting from the reconstruction of the levee and excavation of the ponds. Because the NMFS believes that the channel characteristics of the subject reach of the Applegate River should not vary greatly from that which currently exists, the SONC coho salmon, KMP steelhead, and SONCC chinook spawning, rearing, and migration habitat in the river should not be substantially affected by the existence of the levee or ponds.

Vegetation, particularly trees and shrubs, serve several salmonid habitat functions, including streambank stability, stream shading, production of large woody material that serves as instream habitat, and as a source nutrients and food in the form of organic material and terrestrial insects. Because Copeland would not conduct excavation or construction activities within 100 feet of the Applegate River or other wetland areas on the Wolf site, except for the levee and portions of the connection channel and rock sill, the effects of the proposed actions on riparian vegetation would be small. Within the excavation areas, numerous trees would be removed, but these trees, as well as any large woody debris, would be placed in the ponds to enhance habitat. Vegetation in the area of the levee breach, as well as the along the undamaged levee, is limited primarily to grasses, forbs, and blackberries. A few trees may have to be felled or uprooted to construct the rock sill and the connection channel, but little loss of bank stability or river shading should result. As noted above, Copeland proposes to do extensive plantings of woody vegetation around the perimeter of the pond. As a result, the proposed actions should have little or no long-term adverse effect on riparian vegetation, and hence on the elements of SONC coho salmon, KMP steelhead, and SONCC chinook salmon habitat which depend on riparian vegetation.

B. Effects of Interrelated and Interdependent Actions

Interrelated and interdependent actions are those that would not occur but for the proposed action. As noted above, the excavation of aggregate and construction of the levee at the Wolf site are considered to be activities interrelated to the construction of the connection channel; the effects of the aggregate excavation are analyzed above. In addition, Copeland sells the aggregate it excavates chiefly for use in construction of buildings, roads, etc. There are many companies in southwest Oregon that sell rock for construction purposes; the aggregate is mined from streams or upland deposits, or is blasted from quarries and crushed. Therefore, although it is possible that some of the aggregate excavated by Copeland from the lower Applegate River would be used in construction projects that might adversely affect SONC coho salmon, KMP steelhead, or SONCC chinook salmon, aggregate from other sources would be available whether the 404(b) permit is issued or not. Thus, aside from those discussed above, the proposed action will not result in actions that would not otherwise occur.

C. Cumulative Effects

Cumulative effects are defined in 50 CFR 402.02 as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." The action area for this consultation is the Applegate River watershed. Future Federal actions, including land management activities, are being (or have been) reviewed through separate section 7 consultation processes. In addition, non-Federal actions that require authorization under section 10 of the ESA will be evaluated in section 7 consultations. Therefore, these actions are not considered cumulative to the proposed action. NMFS is not aware of any future new, or changes to existing, State and private activities within the action area that would cause greater impacts to listed species than presently occurs. NMFS assumes that future private and State actions will continue at similar intensities as in recent years.

VI. CONCLUSION

NMFS has determined that, based on the available information, permitting of the construction of Copeland's proposed levee and river-pond excavation channel, along with the interconnected aggregate excavation from the lower Applegate River under Section 404(b) of the Clean Water Act, is not likely to jeopardize the continued existence of SONC coho salmon or result in the destruction or adverse modification of designated critical habitat for this species. NMFS used the best available scientific and commercial data to apply its jeopardy analysis (described in NMFS 1999), when analyzing the effects of the proposed action on the biological requirements of the species relative to the environmental baseline (described in NMFS 1997), together with cumulative effects. The effects of the proposed action on KMP steelhead and SONCC chinook salmon and their habitat would be similar to the effects on SONC coho salmon.

In reaching this conclusion, NMFS determined that the survival and recovery of SONC coho salmon would not be appreciably diminished by the proposed action. This conclusion was reached primarily because: (1) The proposed action would likely cause minor, short-term decreases in water and riparian vegetation quality, but the effects on the essential features of salmon habitat are expected to be negligible or beneficial; (2) while individual juvenile salmonids within the ponds may suffer injury or mortality, the rate of occurrence of adverse effects is expected to be lower or of the same magnitude as that of individuals in the Applegate River; (3) long-term effects to salmon habitat due to the removal of the aggregate from the site and from the reconstruction of the levee are expected to be minor, due to the abundance of suitable substrate for spawning and cover, and to the many factors involved in changes in channel morphology; (4) direct disturbance of SONC coho salmon due to noise, etc. would be minimal, due to the location of the majority of the excavation out of the wetted channel, and the small area of the aggregate excavation operation compared to the remainder of the lower Applegate River; and (5) direct mortality from entrainment in the excavator bucket, etc. should be rare because most individual coho salmon coming into proximity of the equipment should be aware and agile enough to avoid injury.

In the long-term, the presence and use of the ponds may enhance survival for SONC coho salmon, KMP steelhead and SONCC chinook salmon. In addition, the information on fish use, water temperature, riparian plantings, pond persistence, etc. developed through Copeland's monitoring plan will allow an assessment of the effects of the "pond creation" aggregate excavation method on salmonids in southwest Oregon.

VII. REINITIATION OF CONSULTATION

Based on the information provided, NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the actions covered by this Biological Opinion. To ensure protection for a species assigned an unquantifiable level of take, reinitiation of consultation is required: (1) If any action is modified in a way that causes an effect on the listed species that was not previously considered in the information provided and this Biological Opinion; (2) new information or project monitoring reveals effects of the action that may affect the listed species in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action (50 CFR 402.16).

VIII. REFERENCES

Section 7(a)(2) of the ESA requires biological opinions to be based on "the best scientific and commercial data available." This section identifies the data used in developing this opinion, in addition to the BA.

Bell, M.C. 1991. Fisheries handbook of engineering requirements and biological criteria. U.S. Army Corps of Engineers, Portland, Oregon.

Bjornn, T.C. 1978. Survival, production, and yield of trout and chinook salmon in the Lemhi River, Idaho. University of Idaho, College of Forestry, Wildlife and Range Sciences Bulletin 27. Moscow *in* Bjornn, T.C., and D.W. Reiser (1991).

Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *in* W.R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:83-138.

Busby, P.J., T.C. Wainright, G.J. Bryant, L.J. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of West Coast steelhead from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, Coastal Zone and Estuarine Studies Division, Seattle, Washington and Protected Species Management Division, Long Beach, California.

COE (Portland District, U.S. Army Corps of Engineers). 1999. Data from World Wide Web site.

Healey, M.C. 1991. Life history of chinook salmon. Pages 311-393 *in* C. Groot and L. Margolis, eds. Pacific salmon life histories. University of British Columbia Press, Vancouver.

Hubbard, L.E., T.A. Herrett, J.E. Poole, G.P. Ruppert, and M.L. Courts. 1999. Water Resources Data, Oregon, Water Year 1998. U.S. Geological Survey, Portland.

Mabbott, L.B. 1982. Density and habitat of wild and introduced juvenile steelhead trout in the Lochsa River drainage, Idaho. Master's thesis. University of Idaho, Moscow *in* Bjornn, T.C., and D.W. Reiser (1991).

Myers, J.M., R.G. Kope, G.J. Bryant, D.J. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K.G. Neely, S.T. Lindley, and R.S. Waples. 1998. Status review of chinook salmon from Washington, Idaho, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

NMFS (National Marine Fisheries Service). 1997. Biological requirements and status under 1996 environmental baseline: Umpqua River cutthroat trout, Oregon Coast coho salmon, Oregon Coast steelhead, Southern Oregon/Northern California coho salmon, Klamath Mountain Province steelhead, Lower Columbia steelhead, and chum salmon. NMFS, Northwest Region, Seattle, Washington. September, 1997.

NMFS (National Marine Fisheries Service). 1999. The habitat approach: implementation of Section 7 of the Endangered Species Act for actions affecting the habitat of Pacific anadromous salmonids. NMFS, Northwest Region, Habitat Conservation and Protected Resources Divisions, Portland, Oregon. August 1999.

Norman, D.K. 1998. Reclamation of flood-plain sand and gravel pits as off-channel salmon habitat. Washington Geology 26(2/3): 21-28.

ODFW (Oregon Department of Fish and Wildlife). 1988. Rogue basin fisheries evaluation program: Effects of Applegate Dam on the biology of anadromous salmonids in the Applegate River. Phase I completion report. U.S. Army Corps of Engineers contract DACW57-77-C-0033, Portland, Oregon.

ODFW (Oregon Department of Fish and Wildlife). 1989. Rogue basin fisheries evaluation program: Effects of Applegate Dam on steelhead in the Applegate River and recommendations for dam operations. Completion report. U.S. Army Corps of Engineers contract DACW57-77-C-0033, Portland, Oregon.

ODFW (Oregon Department of Fish and Wildlife). 1991. Rogue basin fisheries evaluation: effects of Lost Creek Dam on coho salmon in the Rogue River. Phase II completion report. U.S. Army Corps of Engineers contract DACW57-77-C-0033, Portland, Oregon.

ODFW (Oregon Department of Fish and Wildlife). 1992. Rogue basin fisheries evaluation: effects of Lost Creek Dam on fall chinook salmon in the Rogue River. Phase II completion report. U.S. Army Corps of Engineers contract DACW57-77-C-0033, Portland, Oregon.

Reeve, T., C.L. Buffington, J. Perttu, R. Piaskowski, E. Miller, and H. Rilling. 1999. An assessment of the suitability of constructed alcoves as salmonid habitat: the alcoves in the Applegate River at river mile 16. Applegate River Watershed Council, Star, Oregon.

RVCOG (Rogue Valley Council of Governments). 1997a. Southwest Oregon salmon restoration initiative, Phase 1: a plan to stabilize the native coho population from further decline. February 1997. Central Point, Oregon.

RVCOG (Rogue Valley Council of Governments). 1997b. Southwest Oregon salmon restoration initiative, Phase 1: a plan to stabilize the native steelhead population from further decline. August 1997. Central Point, Oregon.

Sandercock, F.K. 1991. Life history of coho salmon. Pages 395-445 *in* C. Groot and L. Margolis, eds. Pacific salmon life histories. University of British Columbia Press, Vancouver.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. ManTech Environmental Research Services Corp., Corvallis, Oregon.

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. National Marine Fisheries Service, Northwest Fisheries Science Center, Seattle, Washington.

IX. INCIDENTAL TAKE STATEMENT

Sections 4(d) and 9 of the ESA prohibit any taking (harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct) of listed species without a specific permit or exemption. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, and sheltering. Harass is defined as actions that create the likelihood of injuring listed species to such an extent as to significantly alter normal behavior patterns which include, but are not limited to, breeding, spawning, rearing, migrating, feeding, and sheltering. Incidental take is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action is not considered prohibited taking provided that such taking is in compliance with the terms and conditions of this incidental take statement.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

A. Amount or Extent of the Take

The NMFS anticipates that the actions covered by this Biological Opinion—permitting of the river-pond connection channel on the lower Applegate River and interrelated/interdependent activities—have more than a negligible likelihood of resulting in incidental take of SONC coho salmon because of the potential for direct incidental take during or because of extraction of aggregate from areas to which individuals of this species may have access. Effects of actions such as these are largely unquantifiable in the short term, and are not expected to be measurable as long-term effects on the species' habitat or population levels. Therefore, even though NMFS expects some low level of incidental take to occur due to the actions covered by this Biological Opinion, the best scientific and commercial data available are not sufficient to enable NMFS to estimate a specific amount of incidental take to the species itself. In instances such as these, the NMFS designates the expected level of take as unquantifiable. Based on the information provided, NMFS anticipates that an unquantifiable amount of incidental take could occur as a result of the actions covered by this Biological Opinion. The adverse effects of the actions, however, should be confined to the Applegate River.

B. Reasonable and Prudent Measures

The NMFS believes that the following reasonable and prudent measures are necessary and appropriate to minimize the take of listed and proposed species and/or to minimize the adverse modification of designated or proposed critical habitat:

1. The COE shall ensure that Copeland shall minimize the potential for direct incidental take of SONC coho salmon due to in-water excavation and riprap placement.

2. The COE shall ensure that Copeland shall construct the proposed aggregate excavation ponds and their connection to the Applegate River in a manner which will facilitate the beneficial use of the areas by SONC coho salmon.

3. The COE shall ensure that Copeland shall adequately monitor the effects of the existence of the proposed aggregate excavation ponds and their connection to the Applegate River on SONC coho salmon and SONC coho salmon critical habitat.

4. The COE shall ensure that Copeland is required and has the ability to modify the proposed aggregate excavation ponds and their connection to the Applegate River in the event that monitoring reveals that the existence of the ponds is a net detriment to the SONC coho salmon population of the Applegate River.

C. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the COE is responsible for compliance with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1.a. All general and specific conditions placed on the 404(b) permit by the COE shall be implemented by Copeland. These include standard conditions such as minimization of pollution, erosion, and turbidity, and definition of an in-water work window.

1.b. Any injury or mortality to salmonids observed by Copeland as a result of its aggregate operation in the Applegate River shall be reported to the NMFS' Roseburg Field Office within 7 days. In addition, Copeland shall freeze or preserve (in 70% isopropyl alcohol) the carcasses of any salmonids killed and discovered during the excavation to allow species identification by the Roseburg Field Office. Close-up photos of salmonid carcasses that permit species identification may be substituted for the frozen or preserved carcasses.

2.a. Copeland shall contour the pits/ponds in a manner in which salmonid habitat is enhanced. Specifically, when berms are breached between excavation pits, a minimum of 50% of the length of each berm shall be retained in order to form peninsulas or islands in the resulting ponds. This berm retention requirement shall not apply, however, to the berm on either end of the connection channel. Peninsulas and islands previously shown in the *Wolf Site Levee Repair Site Plan* (dated October 1999) cannot be applied to meet the above requirement, but no minimum peninsula or island width is required, and Copeland is encouraged to excavate the elevation of the peninsulas and islands to as low a level as will support woody vegetation. At least 50% of the circumference of the pits between 972 feet MSL (approximately the water surface elevation in the pits/ponds at the typical Applegate River summer low flow level) and 977 feet MSL (pit/pond water surface elevation at a typical Applegate River winter high flow level), including the peninsulas and islands, shall be graded to a slope no steeper than 5:1 to ensure substantial diversity in water depth in the resulting ponds. To hasten establishment of plant and invertebrate populations, topsoil from the site shall be placed on shallow slopes of the pits and into the summer shallow portions of the ponds. In order to potentially concentrate cool groundwater and hyporheic flow during the summer, the deepest potions of at least 50% of the ponds shall consist of interconnected channels no more than 25 feet in width and a minimum of 1 foot deeper than the remainder of the pond. To ensure that fish in the ponds have the ability to escape to the Applegate River in the event of extremely low river flows or high water temperatures, Copeland shall construct the ponds and the river-pond connection channel so that no isolated pools are formed as the water surface elevation of the ponds drops.

2.b. Copeland shall maintain and plant woody vegetation on the periphery of the ponds in a manner in which salmonid habitat is enhanced. To the greatest extent possible, existing woody vegetation shall be incorporated into the riparian areas of the ponds. This shall be accomplished both by constructing the pits in a manner in which existing vegetation is left undisturbed at the periphery of the pits and by transplanting small trees and shrubs from areas to be excavated. Whether obtain from on- or off-site, Copeland shall plant a minimum of 1 tree (mature height >30 feet) per 20 feet of treeless pond circumference, averaged over the circumference of each pond. At least 50% of the trees shall be planted in a location on the pond shoreline, peninsula, or island to as low an elevation as will support those trees. The remainder of the trees shall be planted within 30 linear feet of the edge of the pit. In addition to trees, Copeland shall plant a minimum of one woody shrub (mature height <30 feet) per 5 feet of shrubless pond circumference, averaged over the circumference of each pond. A minimum of 50% of the shrubs shall be of water-tolerant species and shall be planted in the zone between typical high and low-water elevations. The remainder of the shrubs shall be planted within 10 linear feet of the edge of the pit. All plantings shall be maintained until well established, with a minimum of 80% annual survival for 5 years.

2.c. Copeland shall place large woody material, in the form of dead trees with branches and/or roots, in each of the ponds in a manner in which salmonid habitat is enhanced. Specifically, Copeland shall place a minimum of one dead tree (minimum 8 inches in diameter at widest point on trunk and 30 feet in length) per 100 feet of pond circumference. At least 50% of the total length of the trees per pond shall be placed below the elevation of each pond at the 50% accedence flow at the site or Wilderville gage, and at least 25% below the elevation of each pond at the 90% accedence flow. Because conifers tend to persist longer in water than deciduous trees, at least 50% of the trees used as large woody debris should be conifers. Any additional large woody material present at the sites shall be placed adjacent to the required dead trees in order to further increase habitat complexity.

3.a. Copeland shall conduct sufficient monitoring to ensure that the physical characteristics of the ponds are conducive to enhanced survival of Applegate River juvenile SONC coho salmon and other anadromous salmonids. Specifically, Copeland shall measure in the ponds and connection channel: (1) Changes in water surface elevation/depth at varying (but especially at low) river discharges; (2) rates of sediment accumulation; (3) temporal and spatial water temperature trends; and (4) temporal and spatial trends in relevant water chemistry parameters, including, but not necessarily limited to, pH, dissolved oxygen, and turbidity. Appropriate measurements shall also be made in the mainstem of the Applegate River adjacent to the Wolf site to provide a basis of comparison with the observed pond/connection channel values.

3.b. Copeland shall conduct sufficient monitoring to ensure that the biological characteristics of the ponds are conducive to enhanced survival of Applegate River juvenile SONC coho salmon and other anadromous salmonids. Specifically, Copeland shall measure, observe, or describe in (or at) the ponds and connection channel: (1) Growth of tree and shrub plantings and related shading; (2) characteristics of attached (algal and vascular) aquatic plant growth that are relevant to salmonid habitat; (3) characteristics of aquatic macroinvertebrate populations that are relevant to determining whether salmonids in the ponds have sufficient food; and (4) temporal and spatial trends in habits and behavior of native and introduced fishes. Appropriate measurements, observations, and descriptions shall also be made in the mainstem of the Applegate River adjacent to the Wolf site to provide a basis of comparison with the observed pond/connection channel values.

3.c. Copeland shall assemble, analyze, and report data and observations relevant to the continued maintenance of accessibility of Applegate River juvenile SONC coho salmon and other anadromous salmonids to the ponds to the NMFS and ODFW in a manner that will ensure that these agencies have appropriate information upon which to make management decisions about the ponds. In particular, Copeland shall transmit information and make recommendations to the NMFS and ODFW on whether and with what level of spatial and temporal variability do the physical and biological habitat parameters of the ponds and connection channel limit anadromous salmonid habitation and survival in the ponds. In particular, Copeland shall: (1) Study and analyze the degree and patterns of use of the ponds by anadromous salmonids by season, time of day, and water depth; (2) study and analyze the role of predation and competition by native and introduced fishes on anadromous salmonids in the ponds; (3) study and analyze the effect of diel, seasonal, and spatial changes in water temperature and other water quality parameters on anadromous salmonid movements between the ponds and the river and between ponds; and (4) study and analyze the causes and effects of changes in pond depth, sedimentation, aquatic and riparian plant growth, and large woody debris presence and location.

3.d. Copeland shall develop a monitoring plan and report data, observations, analysis and recommendations on a prompt and regular basis to ensure that necessary pond management

decisions are made in a timely manner. Specifically, Copeland shall:
(1) Refrain from fully connecting any excavation pits with the Applegate River until receiving NMFS' approval of a detailed 3-year Wolf site monitoring plan (the monitoring plan shall be submitted to the NMFS within 3 months of the issuance of the COE 404(b) permit, and the monitoring report shall be considered to be approved if the NMFS does not reply to Copeland with suggested revisions within 1 month of NMFS' receipt of the plan); (2) submit an annual report to the NMFS and ODFW prior to the end of the first calendar year in which the plan is begun, and a subsequent annual report by the end of the next two calendar years in which pits/ponds are excavated; (3) submit to the NMFS and ODFW, based on the first three calendar years of monitoring (and simultaneously with the third annual monitoring report), a recommendation for the necessity and scope of additional monitoring and annual reporting in each of any additional years in which pit/pond excavation is performed, plus up to two additional years; (4) submit a final summary monitoring report, with recommendations on the future management of the Wolf site ponds and similar constructed off-channel habitat, simultaneously or within three months of the final annual monitoring report.

4.a. Copeland shall retain the legal, monetary, and equipment-related ability to make specific physical changes to the ponds and connection channel should the NMFS determine that the action is necessary to conserve SONC coho salmon. The specific physical changes are: (1) Alteration of pit shape and slope in active and yet-to-be-excavated pits (i.e., NMFS will not require changes in the shape or slope of pits which have already been connected to the Applegate River or which Copeland considers to be completely excavated except for the final breaching); (2) extent and timing of connection channel-river berm breaching; (3) extent and timing of connection channel-river berm reconstruction; and (4) timing and extent of Copeland-initiated levee reconstruction following flood damage. Copeland shall retain the ability to take these actions, except for item (1), throughout the excavation period plus an additional five years. The NMFS recognizes that a separate COE 404(b) permit may be required to conduct in-water work beyond the scope of the permit currently at issue, but does not expect Copeland to attempt to obtain such a permit until the NMFS requests that Copeland perform such work.